

CLAIMS:

1. A distributed system which makes n computers, which are connected via a network, operate synchronously, and guarantees multiplexing of at least 5 (n - f) computers,
 - each computer comprising:
 - an input candidate collection device configured to collect input data, which is selected as a next candidate to be processed by each of n computers, via 10 the network;
 - a first input candidate selection control device configured to check, when said input candidate collection device has collected not less than (n - f) input data, if the collected not less than (n - f) input data include not less than (n - f) input data having 15 identical contents, and settle, when the collected not less than (n - f) input data include not less than (n - f) input data having identical contents, that input data as next data to be processed;
 - 20 a second input candidate selection control device configured to check, when said first input candidate selection control device determines that the collected input data do not include not less than (n - f) input data having identical contents, if the collected data include input data which have identical contents and 25 hold the majority of the number of collected input data, select, when the collected data include input data

which have identical contents and hold the majority of
the number of collected input data, that input data as
a self candidate, and make said input candidate
collection device re-execute collection of input data
5 after all input data of other candidates are discarded;
and

10 a third input candidate selection control device
configured to arbitrarily select, when said second
input candidate selection control device determines
that the collected data do not include input data which
have identical contents and hold the majority of the
number of collected input data, input data from the
collected input data as a self candidate, and make said
input candidate collection device re-execute collection
15 of input data after all input data of other candidates
are discarded.

2. A system according to claim 1, wherein f is a
maximum integer which satisfies $3f < n$.

20 3. A system according to claim 1, wherein each
computer further comprises:

a journal device configured to hold input data
settled by said first input candidate selection control
device;

25 a first input candidate adjustment control device
configured to send, when another computer collects
input data of a step that has already been settled in
the self computer, input data held in said journal

device as settled input data; and

a second input candidate adjustment control device
configured to settle, when settled input data is sent
from another computer upon collecting input data by
5 said input candidate collection device, that input data
as next data to be processed.

4. A system according to claim 3, wherein said
journal device holds the input data in an order from
latest input data in correspondence with a
10 predetermined number of steps,

said first input candidate adjustment control
device includes an informing device configured to send,
when said journal device does not hold settled input
data to be sent to another computer, a message
15 indicating this to the other computer, and

each computer further comprises:

a state holding device configured to hold
immediately preceding states in steps already settled
in the self computer in correspondence with a
20 predetermined number of steps;

a state exchange device configured to exchange the
immediately preceding state in each step held by said
state holding device with another computer; and

a skip device configured to acquire, when a sum of
25 the number of collected input data and the number of
messages which are sent from other computers and
indicate that settled input data is not held in said

journal device is not less than $(n - f)$, and the number of collected input data is less than $(n - f)$ upon collecting input data by said input candidate collection device, an immediately preceding state in the latest settled step in another computer, in which the settled step has most advanced among all other computers, via said state exchange device, and copy the acquired state to the self computer.

5 5. A system according to claim 1, wherein each computer further comprises:

10 a counter configured to count a virtual time used in a process of input data;

15 a first input data generation device configured to periodically generate first input data for giving an increment timing of a value of said counter;

20 a second input data generation device configured to store a system time of the self computer and generate second input data for giving a comparison timing between the system time and the virtual time counted by said counter; and

25 a virtual time adjustment device configured to compare the system time obtained from the second input data with the virtual time counted by said counter, and set, when the system time leads the virtual time, an increment width of the value of said counter upon processing the first input data to be large.

6. A multiplexing control method for a

distributed system which makes n computers, which are connected via a network, operate synchronously, and guarantees multiplexing of at least $(n - f)$ computers, each computer comprising:

5 the input candidate collection step of collecting
input data, which is selected as a next candidate to be
processed by each of n computers, via the network;

the first input candidate selection control step of checking, when the input candidate collection step has corrected not less than $(n - f)$ input data, if the not less than $(n - f)$ input data include not less than $(n - f)$ input data having identical contents, and settle, when the not less than $(n - f)$ input data include not less than $(n - f)$ input data having identical contents, that input data as next data to be processed;

the second input candidate selection control step of checking, when it is determined in the first input candidate selection control step that the collected input data do not include not less than $(n - f)$ input data having identical contents, if the collected data include input data which have identical contents and hold the majority of the number of collected input data, selecting, when the collected data include input data which have identical contents and hold the majority of the number of collected input data, that input data as a self candidate, and making the input candidate

collection step re-execute collection of input data
after all input data of other candidates are discarded;
and

the third input candidate selection control step
5 of arbitrarily selecting, when it is determined in the
second input candidate selection control step that the
collected data do not include input data which have
identical contents and hold the majority of the number
of collected input data, input data from the collected
10 input data as a self candidate, and making the input
candidate collection step re-execute collection of
input data after all input data of other candidates are
discarded.

7. A method according to claim 6, wherein f is a
15 maximum integer which satisfies $3f < n$.

8. A method according to claim 6, wherein each
computer further comprises:

the journal step of holding input data settled in
the first input candidate selection control step;

20 the first input candidate adjustment control step
of sending, when another computer collects input data
of a step that has already been settled in the self
computer, input data held in the journal step as
settled input data; and

25 the second input candidate adjustment control step
of settling, when settled input data is sent from
another computer upon collecting input data in the

input candidate collection step, that input data as next data to be processed.

9. A method according to claim 8, wherein the journal step includes the step of holding the input data in an order from latest input data in correspondence with a predetermined number of steps, the first input candidate adjustment control device includes the informing step of sending, when settled input data to be sent to another computer is not held in the journal step, a message indicating this to the other computer, and each computer further comprises: the state holding step of holding immediately preceding states in steps already settled in the self computer in correspondence with a predetermined number of steps; the state exchange step of exchanging the immediately preceding state in each step held in the state holding step with another computer; and the skip step of acquiring, when a sum of the number of collected input data and the number of messages which are sent from other computers and indicate that settled input data is not held in the journal step is not less than $(n - f)$, and the number of collected input data is less than $(n - f)$ upon collecting input data in the input candidate collection step, an immediately preceding state in the latest

settled step in another computer, in which the settled step has most advanced among all other computers, via the state exchange step, and copying the acquired state to the self computer.

5 10. A method according to claim 6, wherein each computer further comprises:

the first input data generation step of periodically generating first input data for giving an increment timing of a value of a counter configured to
10 count a virtual time used in a process of input data;

the second input data generation step of storing a system time of the self computer and generating second input data for giving a comparison timing between the system time and the virtual time counted by the
15 counter; and

the virtual time adjustment step of comparing the system time obtained from the second input data with the virtual time counted by the counter, and setting, when the system time leads the virtual time, an
20 increment width of the value of the counter upon processing the first input data to be large.

2025 RELEASE UNDER E.O. 14176